CLAIMS

1. A method for determining the channel gain(s) between one or more emitter(s) and one or more receiver(s), the method comprising the steps of

emitting a first output signal by means of a first emitter, the first output signal being deterministic and containing an interval of frequencies,

receiving a first input signal by means of a first receiver,

determining a transformed first input signal by transforming said first input signal by means of a predetermined linear transform,

determining a first channel gain by means of comparison of said transformed first input signal and a predetermined original first signal being equal to said first output signal being emitted and received noiselessly with a known channel gain and being transformed by means of said linear transform.

2. A method according to claim 1, wherein the step of determining a transformed first input signal further comprises the step of transforming said first input signal by means of at least a second predetermined linear transform.

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3. A method according to claim 1 or 2, wherein the step of determining a transformed first input signal is performed by using a linear transform of full rank.

4. A method according to any of claims 1-3, wherein the step of determining a transformed first input signal is performed by using a convolution transform.

5. A method according to claim 4, wherein the step of determining a transformed first input signal is performed by using a spectral transform.

6. A method according to claim 5, wherein the step of determining a transformed first input signal is performed by using a spread spectrum transform.

7. A method according to claim 5, wherein the step of determining a transformed first input signal is performed by using a sine or cosine transform.

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8. A method according to claim 5 or 7, wherein the step of determining a transformed first input signal is performed by using a local sine or local cosine transform.

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9. A method according to any of claims 1-8, wherein the step of determining a transformed first input signal is performed by using a unitary transform.

10. A method according to any of claims 1-9, wherein the step of determining a transformed first input signal is performed by using a wavelet transform.

11. A method according to any of claims 1-6, wherein the step of determining a transformed first input signal is performed by using a Hadamard transform.

12. A method according to any of claims 1-6, wherein the step of determining a transformed first input signal is performed by using a Rudin-Shapiro transform.

13. A method according to claim 12, wherein the step of determining a transformed first input signal is performed by using a symmetric Rudin-Shapiro transform.

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14. A method according to any of claims 1-13, which, prior to emitting the first output signal, further comprises the step of transforming the predetermined original first signal by means of a linear transform being the inverse transform of the predetermined linear transform, thereby obtaining the first output signal.

15. A method according to any of the preceding claims, further comprising the step of determining the original first signal from an obtained measure of noise applied to the first input signal.

16. A method according to claim 15, wherein said measure of noise is obtained from a comparison of a prior transformed first input signal and the respective prior original first signal.

17. A method according to claim 16, wherein the step of determining the original first signal is performed repeatedly so as to obtain an adaptive determination of the channel gain.

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18. A method according to any of the preceding claims, further comprising the step of choosing a suitable transform for transforming the first input signal, said step being

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performed prior to the step of determining a transformed first input signal, the choice being made based on a previously obtained measure of noise applied to the first input signal.

19. A method according to any of the preceding claims, wherein the step of emitting a first output signal is performed by emitting an electromagnetic output signal.

20. A method according to any of claims 1-18, wherein the step of emitting a first output signal is performed by emitting an acoustic output signal.

21. A method according to any of the preceding claims, wherein the step of receiving a first input signal is performed by receiving an electromagnetic input signal.

22. A method according to any of claims 1-20, wherein the step of receiving a first input signal is performed by receiving an acoustic input signal.

23. A method according to any of the preceding claims, wherein at least the transforming of the first input signal and the comparison of the transformed first input signal and a predetermined original first signal is performed by means of digital processing means.

24. A method according to any of the preceding claims, further comprising the step of reflecting the first output signal using an object, the step being performed prior to the step of receiving a first input signal.

25. A method according to any of the preceding claims, further comprising the step of transmitting the first output signal using an object, the step being performed prior to the step of receiving a first input signal.

26. A method according to claim 24 or 25, further comprising the step of obtaining information about the object.

27. A method according to claim 26, wherein the step of obtaining information about the object comprises obtaining information regarding at least part of a human being.

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28. A method according to any of the preceding claims, further comprising the steps of

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emitting a second output signal by means of a second emitter, the second signal being deterministic and containing an interval of frequencies,

receiving the first input signal by means of the first receiver,

determining the transformed first input signal by transforming said first input signal by means of a predetermined linear transform,

determining a second channel gain by means of comparison of said transformed first input signal and a predetermined original second signal being equal to said second output signal being emitted and received noiselessly and with a known channel gain, wherein the predetermined original first signal and the predetermined original second signal are linearly independent.

29. A method according to any of claims 1-27, further comprising the steps of

receiving a second input signal by means of a second receiver,

determining a transformed second input signal by transforming said second input signal by means of a predetermined linear transform,

determining a second channel gain by means of comparison of said transformed second input signal and the predetermined original first signal being equal to said first output signal being emitted and received noiselessly and with a known channel gain.

30. A method according to any of claims 1-27, further comprising the steps of

emitting a second output signal by means of a second emitter, the second signal being deterministic and containing an interval of frequencies,

receiving a second input signal by means of a second receiver,

determining a transformed second input signal by transforming said second input signal by means of a predetermined linear transform,

determining a second channel gain by means of comparison of said transformed second input signal and the predetermined original first signal,

determining a third channel gain by means of comparison of the transformed first input signal and a predetermined original second signal being equal to said second output signal being emitted and received noiselessly and with a known channel gain,

determining a fourth channel gain by means of comparison of the transformed second input signal and the predetermined original second signal,

wherein the predetermined original first signal and the predetermined original second signal are linearly independent.

31. A method according to claim 30, wherein the step of emitting the first output signal and the step of emitting the second output signal are performed by emitting signals being significant for each of the emitters.

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32. A method according to any of the preceding claims, further comprising the steps of

emitting a plurality of output signals by means of a plurality of emitters, each of the plurality of signals being deterministic and containing an interval of frequencies,

receiving a plurality of input signals by means of a plurality of receivers,

determining a plurality of transformed input signals by transforming each of the input signals of said plurality of input signals by means of a predetermined linear transform,

determining a plurality of channel gains by means of comparison of said plurality of transformed input signals with each of a plurality of predetermined original signals each being equal to one of said plurality of output signals being emitted and received noiselessly and with a known channel gain,

wherein the predetermined original signals are linearly independent.

33. A method according to any of claims 28 or 30-32, wherein the predetermined original signals are orthogonal.

34. A method according to claim 32 or 33, wherein the step of emitting a plurality of output signals is performed by emitting signals being significant for each of the plurality of emitters.

35. A method according to any of claims 32-34, further comprising the step of

determining the position of an object based upon the determined channel gains.

36. A method according to claim 35, wherein the position of the object is determined in three dimensions.

37. A method according to claim 36, further comprising the step of reflecting the emitted signals by the object, said step being performed after the step of emitting the signals, but before the step of receiving the signals.

38. A method according to claim 37, wherein the step of determining the position of an object comprises the steps of

determining the channel gains,

determining relative distances of the object, said relative distances being based upon the determined channel gains,

converting the relative distances into a three dimensional position.

39. A method according to claim 38, wherein the step of converting the relative distances into a three dimensional position is performed by means of a neural network.

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40. A method according to claim 38 or 39, wherein the step of converting the relative distances into a three dimensional position is performed by means of geometrical observations.

41. A method according to any of claims 35-40, further comprising the step of determining the motion of the object.

42. A method according to any of claims 35-41, further comprising the step of determining the spatial orientation of the object.

43. A method according to any of claims 1-27, further comprising the steps of

detecting the presence of an object in the vicinity of at least one of the one or more emitter(s) and/or in the vicinity at least one of the one or more receiver(s) by means of comparing the determined channel gain with a predetermined threshold value,

performing a predetermined action in case the determined channel gain exceeds said predetermined threshold value.

44. A method according to claim 43, wherein the step of performing a predetermined action is performed by opening a door being in the vicinity of the object.

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45. A method according to any of claims 1-27, wherein the step of emitting a first output signal is performed by using a movable emitter, and wherein the step of receiving a first input signal is performed using at least two substantially stationary receivers, the method further comprising the steps of

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determining the distance between the emitter and each of the receivers from the determined channel gains, and

determining the position of the emitter by combining the determined distances.

46. A method according to any of claims 1-27, wherein the step of emitting a first output signal is performed by using a movable emitter, and wherein the step of receiving a first input signal is performed using at least three substantially stationary receivers, the method further comprising the steps of

determining the mutual ratios between the determined channel gains, and

determining the position of the emitter by combining the determined ratios.

47. A method according to claim 45 or 46, wherein the emitter and the receivers are comprised in an audio system, the method further comprising the step of adjusting the loud speakers of the audio system according to the position of the first emitter.

48. A method according to any of claims 1-27, further comprising the steps of

inserting a time delay before the step of emitting the first output signal,

determining the contribution of the received input signal from other sources than the first output signal,

reducing said contribution of the received output signal.

49. A method according to claim 48, wherein the step of determining the contribution of the received input signal from other sources than the first output signal is performed by autocorrelation between the predetermined original first signal and the transformed first input signal.

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50. A method according to claim 48 or 49, wherein the contribution from other sources than the first output signal is originating from cross talk between electrical conductors on a printed circuit board.

51. A method according to any of claims 1-27, further comprising the step of obtaining information regarding the temperature of one or more parts of an object.

52. A method for transmitting signals, the method comprising the steps of

selecting an output signal from a predetermined set of output signals,

emitting the selected output signal by means of the emitter,

receiving an input signal by means of a receiver,

determining a transformed input signal by transforming said input signal by means of a predetermined linear transform,

comparing the transformed input signal with a predetermined set of original signals, each of said original signals being equal to one of said output signals of the predetermined set of output signals being emitted and received noiselessly with a known channel gain and being transformed by means of said linear transform, and

identifying the selected first output signal from said comparison.

53. A pointing device for a computer comprising

emitter means for emitting one or more output signal(s), the signal(s) being deterministic and containing an interval of frequencies,

receiving means for receiving one or more input signal(s),

first determining means for determining one or more transformed input signal(s), the first determining means comprising means for transforming said input signal(s) by means of a predetermined linear transform,

second determining means for determining one or more channel gain(s), the second determining means comprising means for comparison of said transformed input signal(s) and one or more predetermined original signal(s) each being equal to one of said output signal(s) being emitted and received noiselessly with a known channel gain and being transformed by means of said linear transform,

converting means for converting the determined channel gain(s) into a three dimensional position of an object, and for converting said three dimensional position into a position of the pointing device.

54. A pointing device according to claim 53, further comprising data communication means for communication between the pointing device and an external computer device.

55. A pointing device according to claim 54, wherein the data communication means is wireless.

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56. A pointing device according to any of claims 53-55, ~~wherein the object is at least part of a human being.~~